

# Introduction to Occupational Safety and Health



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# OSHAcademy Course 600 Study Guide

## Introduction to Occupational Safety and Health

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Contact OSHAcademy to arrange for use as a training document.

This study guide is designed to be reviewed off-line as a tool for preparation to successfully complete OSHAcademy Course 600.

Read each module, answer the quiz questions, and submit the quiz questions online through the course webpage. You can print the post-quiz response screen which will contain the correct answers to the questions.

The final exam will consist of questions developed from the course content and module quizzes.

We hope you enjoy the course and if you have any questions, feel free to email or call:

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## Module 1: Intro to OSHA

In 1970, the United States Congress and President Richard Nixon created the Occupational Safety and Health Administration (OSHA), a national public health agency dedicated to the basic proposition that no worker should have to choose between their life and their job.

Passed with bipartisan support, the creation of OSHA was a historic moment of cooperative national reform. The OSHA law makes it clear the right to a safe workplace is a basic human right. Since OSHA's first day on the job, the agency has delivered remarkable progress for our nation. Workplace



injuries, illnesses and deaths have fallen dramatically. Together with state partners, OSHA has tackled deadly safety hazards and health risks. The organization has established common sense standards and enforced the law against those who put workers at risk. The standards, enforcement actions, compliance assistance and cooperative programs have saved thousands of lives and prevented countless injuries and illnesses.

Although OSHA has made major strides in reducing worker deaths, the chart below clearly indicates the need for continued efforts to further reduce worker deaths.

WORKERS KILLED			
YEAR	TOTAL	Avg./week	Avg./day
2010	4,690	90	13
2009	4,551	88	12

Source: <http://www.osha.gov/oshstats/commonstats.html>, October 11, 2012

The leading causes of worker deaths on construction sites in 2011 were falls, followed by electrocution, struck by object and caught-in/between. These "Fatal Four" were responsible for nearly three out of five construction worker deaths. Eliminating the "Fatal Four" would save 410 workers' lives in America every year.

OSHA is not just concerned with work related deaths; instead OSHA oversees all aspects of worker health and safety. This includes work related accidents and illnesses. For example, OSHA has established rules to help prevent workers from being exposed to environments which could cause physical injury or illness.

## 10 Most Cited Standards

For the FY 2013, according to the National Safety Council, the 10 most cited standards were the following:

1. Fall protection (1926.451)
2. Hazard Communication (1910.1200)
3. Scaffolding (1926.451)
4. Respiratory protection (1910.134)
5. Electrical, Wiring (1910.305)
6. Powered Industrial Trucks (1910.178)
7. Ladders (1926.1053)
8. Lockout/Tagout (1919.147)
9. Electrical, General 1910.303)
10. Machine Guarding (1910.212)

## Private Sector Workers

OSHA covers most private sector employers and workers in all 50 states, the District of Columbia, and other U.S. jurisdictions, either directly through Federal OSHA or through an OSHA-approved state plan. State plans are OSHA-approved job safety and health programs operated by individual states instead of Federal OSHA. The OSH Act encourages states to develop and operate their own job safety and health programs and precludes state enforcement of OSHA standards unless the state has an approved program. OSHA approves and monitors all state plans and provides as much as fifty percent of the funding for each program. State-run safety and health programs must be at least as effective as the Federal OSHA program.

The following states have approved state plans:

- Alaska
- California
- Hawaii
- Indiana
- Kentucky
- Michigan
- Nevada
- New Mexico
- North Carolina
- Puerto Rico
- Tennessee
- Vermont
- Virginia
- Wyoming
- Arizona
- Connecticut
- Illinois
- Iowa
- Maryland
- Minnesota
- New Jersey
- New York
- Oregon
- South Carolina
- Utah
- Virgin Islands
- Washington

Note: The Connecticut, Illinois, New Jersey, New York and Virgin Island plans cover public sector (state and local government) employment only.

### [OSHA's State Occupational Safety and Health Plans](#)

#### **Employee Rights:**

As an employee, you have several rights when it comes to the OSH Act:

1. You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
2. You have the right to request an OSHA inspection if you believe there are unsafe and unhealthful conditions in your workplace.

3. You can file a complaint with OSHA within 30 days of retaliation or discrimination by your employer for making safety and health complaints.
4. You have the right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violations.
5. Your employer must correct workplace hazards by the date indicated on the citation and must certify these hazards have been reduced or eliminated.
6. You have the right to copies of your medical records and records of your exposures to toxic and harmful conditions or substances.
7. Your employer must post this notice in your workplace.
8. You must comply with all occupational safety and health standards issued under the OSH Act that apply to your own actions and conduct on the job.

There are several reasons OSHA is important in protecting the employee. In one example, the U.S. Department of Labor's Occupational Safety and Health Administration has issued 54 workplace safety and health citations with penalties totaling \$1.2 million to gun powder substitute manufacturer Black Mag LLC.

### Scenario

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On May 14, two workers and a plant supervisor were manufacturing a gun powder substitute known as Black Mag powder when the explosion occurred. The workers had been required to hand feed powder into operating equipment due to the employer's failure to implement essential protective controls. The employer also chose not to implement remote starting procedures, isolate operating stations, establish safe distancing and erect barriers or shielding - all of which are necessary for the safe manufacture of explosive powder. Additionally, the employer chose not to provide the personal protective equipment and other safety measures its employees needed to work safely with such hazardous material. OSHA cited the company with four egregious willful, 12 willful, 36 serious and two other-than-serious violations with total penalties of \$1,232,500.

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As you can see by the above example, OSHA is making a difference. In four decades, OSHA and its state partners, coupled with the efforts of employers, safety and health professionals,

unions and advocates, have had a dramatic effect on workplace safety. Since 1970, workplace fatalities have been reduced by more than 65 percent and occupational injury and illness rates have declined by 67 percent. At the same time, U.S. employment has almost doubled. Worker deaths in America are down — from about 38 worker deaths a day in 1970 to 13 a day in 2010. Worker injuries and illnesses are also down — from 10.9 incidents per 100 workers in 1972 to fewer than 4 per 100 in 2010.

## Module 1 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. The top two OSHA cited workplace violations in 2013 were:**
  - a. fall protection and hazard communication
  - b. respiratory protection and ladders
  - c. machine guarding and hazard communication
  - d. scaffolding and machine guarding
  
- 2. In 2011, what were the leading causes of deaths on construction sites?**
  - a. sickness and falls
  - b. electrocutions and falls
  - c. concussions and heart attacks
  - d. heart attacks and falls
  
- 3. As an employee, you have the following rights when it comes to the OSH Act:**
  - a. Employees can do whatever they want, as long as it's safe.
  - b. Employees can file a complaint with OSHA within 30 days of retaliation by your employer for making safety and health complaints.
  - c. Employees MUST notify their employer about workplace hazards.
  - d. Employees cannot see OSHA citations issued to their employer.
  
- 4. You should comply with all occupational safety and health standards issued under the OSH Act that apply to your own actions and conduct on the job.**
  - a. true
  - b. false

## Module 2: Hazard Awareness

### What are the hazards?

The answer to this question may seem obvious, but supposed obvious hazards can be easily overlooked. Many workplaces contain hazardous materials including raw materials (wood, metal, plastic) to be manufactured into finished goods, and toxic chemicals (solvents, acids, bases, detergents) used at various stages of the process. As an employee, being aware of these hazards is important to ensuring your safety. There can be many hazards in the workplace, and being able to identify these hazards can help prevent accidental injury or illness.

Other hazards you should be aware of:

- Stationary machinery and equipment may not be properly guarded, or in poor working order because of poor preventive/corrective maintenance.
- Tools may not be properly maintained.
- Saws may not be sharpened or safety harnesses may be old and in need of replacement.
- The work environment might include extreme noise, flammable or combustible atmospheres, or poor workstation design.
- Floors may be slippery and isles cluttered.
- Guardrails, ladders, or floor-hole covers may be missing or damaged.
- Employees might be fatigued, distracted in some way, or otherwise lack the mental or physical capacity to accomplish work safely.

Some or all of these potential safety hazards may exist in a workplace. The list could go on and on. It's vitally important that workers and supervisors are knowledgeable to ensure that workplace hazards are identified and eliminated as soon as possible.

A proactive supervisor should encourage employees to report any potential hazards immediately. Safety should always be a company's first priority. Many businesses do place a high value on safety, but not all do.

Although an employer is responsible for identifying workplace hazards, you should be proactive about your safety and be aware of your environment and potential hazards.

## What is a hazard?

In the previous section, we listed several different types of hazards. So why are we asking what a hazard is? One of the goals of this training is to give you the tools to help identify hazards in the workplace. In order to do this, it's important to understand what a hazard is!

OSHA usually defines a hazard as, "a danger which threatens physical harm to employees." Expanding on that basic definition we can think of a hazard as an "unsafe workplace condition or practice (danger) that could cause an injury or illnesses (harm) to the employee."

A hazard may be an object (tools, equipment, machinery, materials) or a person (when distracted, mentally/physically incapable). It's important to know a hazard is only one part in the "accident formula" described. It takes a hazard and exposure before an accident can occur.

The first step in controlling workplace hazards is to first identify them. We want to determine what hazards are present. You want to know what a hazard looks like, what kind of accidents might it cause, and how severe the resulting injuries might be.

One way to identify hazards is to perform a safety inspection. Safety inspections should do more than simply identify hazardous conditions. They should provide useful data for the purpose of effective analysis and evaluation of the safety management system. Sounds complicated, but it's really not.

There are five basic methods you can use to identify workplace hazards before an accident occurs:

1. informal observations, and formal observation programs
2. comprehensive company-wide surveys
3. individual interviews
4. walk-around inspections
5. documentation review

You may not be the person conducting the safety inspection in your workplace, but if you understand what it is, you might be able to provide valuable information as a part of the process.



## "Recognized" Hazards

Occasionally, students ask what is considered a "recognized" hazard in the workplace. As described in OSHA's Field Compliance Manual, recognition of a hazard is established on the basis of industry recognition, employer recognition, or "common sense" recognition criteria. Let's take a closer look at these three categories to better understand what OSHA means.

- **Industry Recognition.** A hazard is recognized if the employer's industry recognizes it. Recognition by an industry, other than the industry to which the employer belongs, is generally insufficient to prove industry recognition. Although evidence of recognition by the employer's specific branch within an industry is preferred, evidence that the employer's industry recognizes the hazard may be sufficient.
- **Employer Recognition.** A recognized hazard can be established by evidence of actual employer knowledge. Evidence of such recognition may consist of written or oral statements made by the employer or other management or supervisory personnel during or before the OSHA inspection, or instances where employees have clearly called the hazard to the employer's attention.
- **Common Sense Recognition.** If industry or employer recognition of the hazard cannot be established, recognition can still be established if it is concluded that any reasonable person would have recognized the hazard. This argument is used by OSHA only in flagrant cases. *Note: Throughout our courses we argue that "common sense" is a dangerous concept in safety. Employers should not assume that accidents in the workplace are the result of a lack of common sense.*

## "Foreseeable" hazards

Another important question to ask about the nature of a hazard relates to whether it was "foreseeable." A hazard for which OSHA issues a citation must be reasonably foreseeable. All the factors which could cause a hazard need not be present in the same place at the same time in order to prove foreseeability of the hazard; e.g., an explosion need not be imminent.

Remember, a foreseeable hazard is one that may be reasonably anticipated. Employees and employers should always evaluate hazards based on what could be anticipated, not just what the current environment is at that moment.

### EXAMPLE

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If combustible gas and oxygen are present in sufficient quantities in a confined area to cause an explosion if ignited but no ignition source is present or could be present, no OSHA violation would exist. If an ignition source is available at the workplace and the employer has not taken sufficient safety precautions to preclude its use in the confined area, then a foreseeable hazard may exist.

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It is necessary to establish the reasonable foreseeability of the general workplace hazard, rather than the particular hazard which led to the accident.

### EXAMPLE

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A titanium dust fire may have spread from one room to another only because an open can of gasoline was in a second room. An employee who usually worked in both rooms was burned in the second room from the gasoline. The presence of gasoline in the second room may be a rare occurrence. It is not necessary to prove that a fire in both rooms was reasonably foreseeable. It is necessary only to prove that the fire hazard, in this case due to the presence of titanium dust, was reasonably foreseeable.

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All these activities to identify hazards in the workplace are so important to the overall effectiveness of your safety management system. Be sure you integrate these activities into the line positions...employees, supervisors and managers...safety is a line responsibility!

Now that we have learned about hazards in general, let's take a closer look at some specific workplace hazards you need to be aware of.

### Fall Protection

A fall hazard is anything in the workplace that could cause an unintended loss of balance or bodily support and result in a fall.

Fall hazards cause accidents such as the following:

- A worker walking near an unprotected leading edge trips over a protruding board.
- A worker slips while climbing an icy stairway.

- A makeshift scaffold collapses under the weight of four workers and their equipment.
- A worker carrying a sheet of plywood on a flat roof steps into a skylight opening.

Here is a real-life example involving a company cited for violations related to fall hazards. As you will read, a contractor fell from a sixth floor balcony.

### Real-life Scenario

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The U.S. Department of Labor's Occupational Safety and Health Administration has cited Blade Contracting Inc., based in Staten Island, with seven safety – including one willful – violations for fall hazards at a Jersey City, N.J., work site. The investigation was initiated after a worker with the masonry contractor was injured by falling from a sixth floor balcony while attempting to access a suspension scaffold. Proposed penalties total \$136,290.

The willful violation reflects the use of makeshift devices on top of scaffolds to increase the level height for working and a failure to protect workers on scaffolds from fall hazards. A willful violation is one committed with intentional knowledge or voluntary disregard for the law's requirements, or with plain indifference to worker safety and health.

Four serious violations involve a failure to install cross bracing on the entire scaffold, ensure personal fall arrest systems were attached to a secure anchorage point and not scaffold guard rails, train workers to recognize and avoid hazards including falls, and ensure proper step ladder use. A serious violation occurs when there is substantial probability that death or serious physical harm could result from a hazard about which the employer knew or should have known.

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In this example, the company had several violations that contributed to the worker's injuries. All of these hazards were foreseeable and could have been prevented.

### How to evaluate fall hazards

The purpose of evaluating fall hazards is to determine how to eliminate or control them before they cause injuries. Below are important factors to consider in conducting an evaluation.

#### *Involve others*

You may need others to help you evaluate fall hazards. Involve others who may have experience identifying fall hazards, such as fellow employees or supervisors; they'll help you identify the hazards and determine how to eliminate or control them. Involving others also strengthens your company's safety and health program.

### *Identify tasks that could expose workers to falls*

As part of the hazard identification process, evaluate each task you will be performing and look for anything that might expose you to a fall hazard. For example, if you will be climbing a ladder to change a light bulb, make sure the ladder is not damaged and that the ladder is stable.

Ensure all walking/working surfaces have the strength to support workers and their equipment and then identify all tasks that could expose workers to falls. A walking/working surface is any surface, horizontal or vertical, on which a person walks or works.

### *Identify fall hazards that you can eliminate*

Eliminating a fall hazard is the most effective fall-protection strategy. Here are some ways to eliminate fall hazards:

- Perform construction work on the ground before lifting or tilting it to an elevated position.
- Install permanent stairs early in the project so that workers don't need to use ladders between floors.
- Use tool extensions to perform work from the ground.

### *Prevent fall hazards*

If you can't eliminate fall hazards, you need to prevent falls or control them so workers who may fall are not injured. Eliminating fall hazards is the best prevention, but if you can eliminate the hazard, you must take steps to prevent or control a fall. Here are some ways to do this:

- Ways to prevent falls include covers, guardrails, handrails, perimeter safety cables, and personal fall-restraint systems.
- Ways to control falls include personal fall-arrest systems, positioning-device systems, and safety-net systems. Use these fall-protection systems only when you can't eliminate fall hazards or prevent falls from occurring.

### **What is supported access?**

Portable ladders, supported scaffolds, and aerial lifts let you get to a work area and support you while you work. They make getting to a work area easy, but they can cause falls when they're not used properly.

## Portable ladders

Portable ladders are versatile, economical, and easy to use. However, workers sometimes use them without thinking about using them safely. Each year, most workers are injured when they fall from ladders. **Most of the falls are less than 10 feet.**

We use ladders to do all sorts of tasks, so it's not surprising that many types of ladders are available. Let's look at the most common types.

## Common types of portable ladders



### **Straight Ladder (left)**

The most common type of portable ladder. Length cannot exceed 30 feet. Available in wood, metal, and reinforced fiberglass. Supports only one worker.



### **Standard Folding Ladder (right)**

Folding ladders have flat steps, a hinged back, and is not adjustable. For use only on firm, level surfaces. Available in metal, wood, or reinforced fiberglass. Must have a metal spreader or locking arm and cannot exceed 20 feet. Supports only one worker.



### **Extension Ladder (left)**

Extension ladders offer the most length in a general-purpose ladder. They have two or more adjustable sections. The sliding upper section must be on top of the lower section. Made of wood, metal, or fiberglass. Maximum length depends on material. Supports only one worker.



### **Platform Ladder (right)**

Platform ladders have a large, stable platform near the top that supports one worker. Length cannot exceed 20 feet.

#### **Trestle Ladder (left)**



Trestle ladders have two sections that are hinged at the top and form equal angles with the base. Used in pairs to support planks or staging. Rungs are not used as steps. Length cannot exceed 20 feet.

#### **Tripod (Orchard) Ladder (right)**



Tripod ladders have a flared base and a single back leg that provides support on soft, uneven ground. Length cannot exceed 16 feet. Metal and reinforced fiberglass versions are available. Supports only one worker.

It's important to choose the right ladder for the right job. Using a ladder for a task that it was not designed for may increase the risk of falling.

### **Basic Ergonomics**

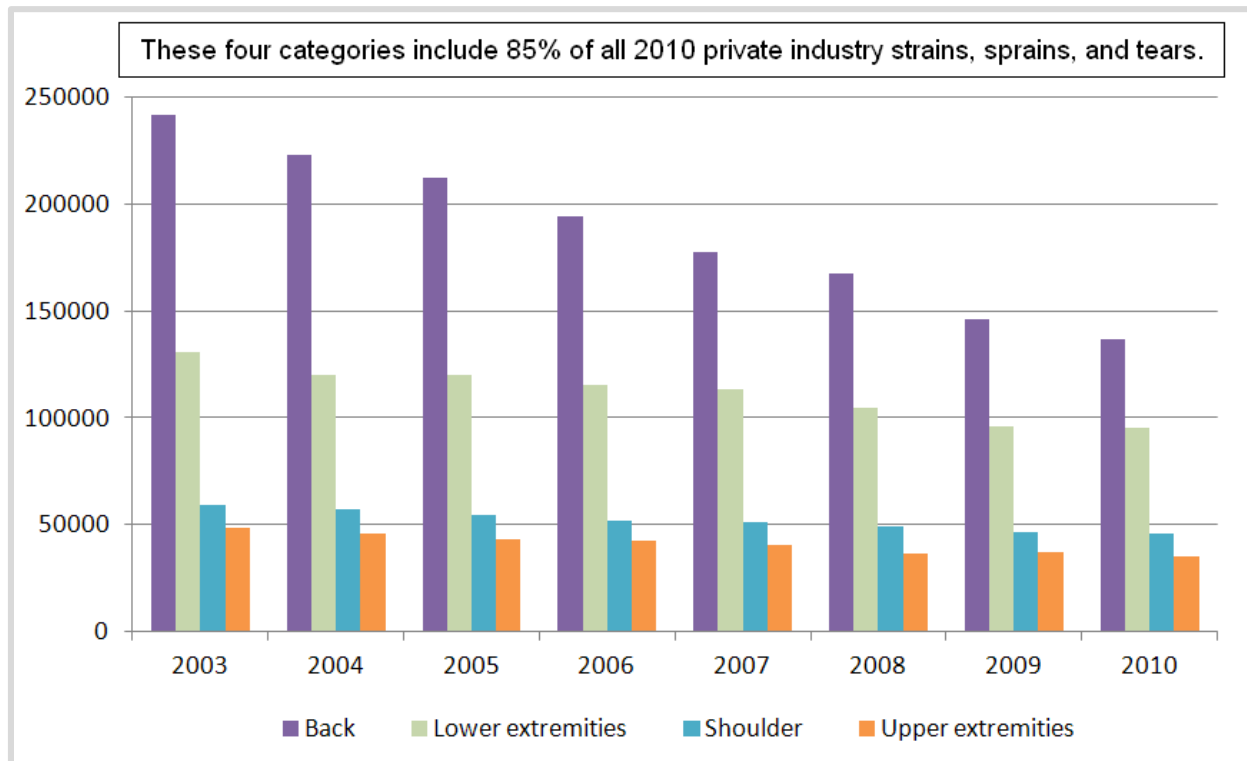
Webster's New World Dictionary (College Edition) defines ergonomics as "The Study of the problems of people in adjusting to their environment; especially the science that seeks to adapt work or working conditions to suit the individual worker." To better understand what ergonomics is and how it affects you and other employees, we need to go explore the topic further.

Ergonomics may be thought of as the science of fitting the job to the individual worker. When there is a mismatch between the physical requirements of the job and the physical capacity of the worker, musculoskeletal disorders (MSDs), such as sprains and strains, can result.

Musculoskeletal disorders in the workplace are common and often the result of poor ergonomics. Over the last decade, ergonomics in the workplace has become more of a safety and health focus. As a result, ergonomic related injuries have been on the decline. The graph on the next page shows the decreasing trend in these types of injuries.

Ergonomics studies the various risk factors brought to a job. Listed below are three areas within which ergonomic risk factors exist.

- risk factors inherent in the worker
- risk factors inherent in the task
- risk factors inherent in the environment



Source: Bureau of Labor and Statistics, [http://www.bls.gov/news.release/archives/osh2\\_11092011.pdf](http://www.bls.gov/news.release/archives/osh2_11092011.pdf), October 25<sup>th</sup>, 2012.

Workers come in all shapes and sizes, each with unique attributes that present certain ergonomic risk factors to a given job. The task(s) of the job can present risk factors that increase the likelihood of an injury. Finally, the workplace environment, within which the worker and job exist, may also contain exposures to risk factors.

To better understand ergonomics, we need to understand musculoskeletal disorders. Let's take a closer look at these MSDs.



## What are Musculoskeletal Disorders?

Musculoskeletal disorders (MSDs) include a group of conditions that involve the nerves, tendons, muscles, and supporting structures such as intervertebral discs. They represent a wide range of disorders, which can differ in severity from mild, periodic symptoms to severe, chronic and debilitating conditions.

Below is a list of examples.

- carpal tunnel syndrome
- tenosynovitis
- tension neck syndrome
- low back pain

MSDs are often confused with ergonomics. Ergonomics is the science of fitting workplace conditions and job demands to the capabilities of workers. In other words, **MSDs are the problem and ergonomics is a solution.**

Contributing factors are aspects of work tasks that can lead to fatigue, MSD symptoms and injuries, or other types of problems. These factors may be present in one or more of the tasks employees must perform to accomplish their jobs.

The contributing factors you should be aware of include:

- awkward postures
- repetitive motions
- forceful exertions
- pressure points (e.g., local contact stress)
- vibration

There are also environmental factors associated with the workplace that can cause problems. Extreme high temperatures can increase the rate at which the body will fatigue. Exposure of the hands and feet to cold temperatures can decrease blood flow, muscle strength, and manual dexterity. These conditions can also cause excessive grip force to be applied to tool handles or

objects. Another problem may be caused by tools or equipment that exhausts cold or hot air directly onto the operator. In addition, the lighting in a workplace may be too dark or too bright for the work task. This may result in employees assuming awkward postures to accomplish work tasks and a loss of product quality.

### Interesting ergonomics statistics

- Musculoskeletal disorders (MSDs) accounted for 30 percent of the injuries and illnesses with days away from work, the same percentage as in 2005.
- Sprains and strains was the leading nature of injury and illness in every major industry sector. These injuries decreased by 6 percent for total private industry in 2006 and for both goods-producing and service-providing industries.
- Trade, transportation, and utilities reported 157,380 sprains and strains; 33 percent of the total.
- The overall number of cases of carpal tunnel syndrome decreased by 21 percent.
- Workers on the job 5 years or more had a decrease of 27 percent for these kinds of illnesses.

### Electrical Safety

The first step toward protecting yourself when dealing with electricity is recognizing the many hazards you face on the job. To do this, you must know which situations can place you in danger. Knowing where to look helps you to recognize hazards.

- Inadequate wiring is dangerous.
- Exposed electrical parts are dangerous.
- Overhead power lines are dangerous.
- Wires with bad insulation can give you a shock.
- Electrical systems and tools that are not grounded or double-insulated are dangerous.
- Overloaded circuits are dangerous.
- Damaged power tools and equipment are electrical hazards.

- Using the wrong PPE is dangerous.
- Using the wrong tool is dangerous.
- Some on-site chemicals are harmful.
- Defective ladders and scaffolding are dangerous
- Ladders that conduct electricity are dangerous.
- Electrical hazards can be made worse if the worker, location, or equipment is wet.

## Scenario

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A 40 year old male meter technician had just completed a seven week basic lineman training course. He worked as a meter technician during normal working hours and as a line during unplanned outages. One evening, he was called to repair a residential power outage. By the time he arrived at the site of the outage, he had already worked two hours of overtime and worked 14 straight hours the day before. At the site, a tree limb had fallen across an overhead power line. The neutral wire in the line was severed and the two energized 120-volt wires were disconnected. The worker removed the tree limb and climbed up a power pole to reconnect the three wires. He was wearing insulated gloves, a hard hat, and safety glasses.

He prepared the wires to be connected. While handling the wires, one of the energized wires caught the cuff of his left glove and pulled the cuff down. The conductor contacted the victim's forearm near the wrist. He was electrocuted and fell backwards. He was wearing a climbing belt, which left him hanging upside down from the pole. Paramedics arrived five minutes after the contact. The power company lowered his dead body 30 minutes later.

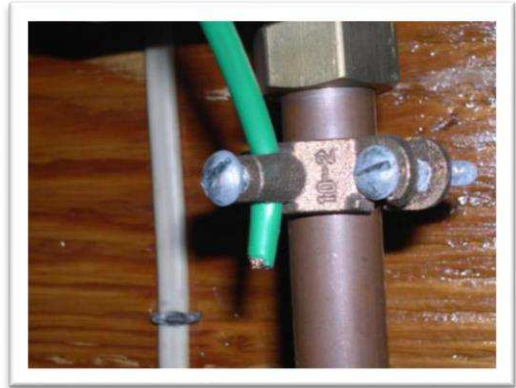
Several factors may have contributed to this incident. Below are some ways to eliminate these risk factors:

- Ask for assistance when you are assigned tasks that cannot be safely completed alone. The task assigned to the victim could not have been done safely by only one person.
  - Do not work overtime performing hazardous tasks that are not part of your normal assignments.
  - Employees should only be given tasks they are qualified to perform.
  - All employees below the journeyman level should be supervised.
-

## Overhead power line hazards

Most people do not realize overhead power lines are typically not insulated. More than half of all electrocutions are caused by direct worker contact with energized power lines. Power line workers must be especially aware of the dangers of overhead lines. In the past, 80% of all lineman deaths were caused by contacting a live wire with a bare hand. Due to such incidents, all linemen now wear special rubber gloves that protect them up to 34,500 volts. Today, most electrocutions involving overhead power lines are caused by failure to maintain proper work distances.

Shocks and electrocutions occur where physical barriers are not in place to prevent contact with the wires. When dump trucks, cranes, work platforms, or other conductive materials (such as pipes and ladders) contact overhead wires, the equipment operator or other workers can be killed. If you do not maintain required clearance distances from power lines, you can be shocked and killed. (The minimum distance for voltages up to 50kV is 10 feet. For voltages over 50kV, the minimum distance is 10 feet plus 4 inches for every 10 kV over 50kV.) Never store materials and equipment under or near over-head power lines. You need to recognize that overhead power lines are a hazard.



## Improper grounding hazards

If an electrical system is not grounded properly, a hazard exists. The most common OSHA electrical violation is improper grounding of equipment and circuitry. The metal parts of an electrical wiring system we touch (switch plates, ceiling light fixtures, conduit, etc.) should be grounded and at 0 volts. If the system is not grounded properly, these parts may become energized. Metal parts of motors, appliances, or electronics that are plugged into improperly grounded circuits may be energized. When a circuit is not grounded properly, a hazard exists because unwanted voltage cannot be safely eliminated. If there is no safe path to ground for fault currents, exposed metal parts in damaged appliances can become energized. Extension cords may not provide a continuous path to ground because of a broken ground wire or plug. If you contact a defective electrical device that is not grounded (or grounded improperly); you will be shocked. You need to recognize that an improperly grounded electrical system is a hazard.

## Wet conditions hazards

Working in wet conditions is hazardous because you may become an easy path for electrical current. For instance, if you touch a live wire while standing in even a puddle of water, you will

probably receive a shock. Damaged insulation, equipment, or tools can expose you to live electrical parts. A damaged tool may not be grounded properly, so the housing of the tool may be energized, causing you to receive a shock. Improperly grounded metal switch plates and ceiling lights are especially hazardous in wet conditions. If you touch a live electrical component with a non-insulated hand tool, you are more likely to receive a shock when standing in water. Remember, you don't have to be standing in water to be electrocuted. Wet clothing, high humidity, and perspiration also increase your chances of being electrocuted. You need to recognize that all wet conditions are hazards.

## Module 2 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. How does OSHA define a “hazard?”**
  - a. “A danger which threatens physical harm to employees”
  - b. “To take a chance or a risk”
  - c. “The absence of lack of predictability”
  - d. “Something causing unavoidable harm”
  
- 2. According to the text, it takes both \_\_\_\_\_ and \_\_\_\_\_ before an accident can occur.**
  - a. lack of knowledge, experience
  - b. hazard, exposure
  - c. carelessness, distraction
  - d. fatigue, carelessness
  
- 3. \_\_\_\_\_ is a method used to identify workplace hazards before an accident occurs.**
  - a. Individual interviews
  - b. Walk-around inspections
  - c. Accident and injury reports
  - d. both (a) and (b)
  
- 4. Employee fatigue and distraction are not hazards in the workplace.**
  - a. true
  - b. false
  
- 5. Fall hazards cause accidents such as:**
  - a. worker walking near an unprotected leading edge trips over a protruding board
  - b. worker slips while climbing on an icy stairway
  - c. worker carrying a sheet of plywood on a flat roof steps into a skylight opening
  - d. all of the above

- 6. According to the text, when evaluating fall hazards, you should:**
- a. involve others
  - b. speak to your supervisor about your concerns
  - c. identify fall hazards you can eliminate
  - d. both (a) and (c)
- 7. Each year, most workers are injured when they fall from ladders. Most of the falls are less than \_\_\_\_\_ feet.**
- a. 5
  - b. 10
  - c. 15
  - d. 20
- 8. Carpal Tunnel Syndrome is an example of a Musculoskeletal Disorder (MSD).**
- a. true
  - b. false
- 9. According to the text, \_\_\_\_\_ are the problem and \_\_\_\_\_ is the solution.**
- a. musculoskeletal disorders, ergonomics
  - b. employees, management
  - c. job Demands, training
  - d. distractions, supervising
- 10. What was the leading cause of injury and illness in every major industry sector in 2006?**
- a. sprains, strains
  - b. Carpal Tunnel Syndrome
  - c. neck or back pain
  - d. repetitive motions
- 11. Overhead power lines are usually not insulated.**
- a. true
  - b. false



**12. According to the text, what causes the most electrocutions?**

- a. touching bare lines
- b. failure to keep safe distances
- c. storing material or equipment under or near overhead power lines
- d. employees who don't wear gloves

**13. What is the most common OSHA electrical violation?**

- a. improper grounding of equipment & circuitry
- b. wet hazard conditions
- c. broken ground wire or plug
- d. defective electrical device

**14. You need to be standing in water to be electrocuted.**

- a. true
- b. false

**15. What increases your chances of being electrocuted?**

- a. wet clothing
- b. humidity
- c. standing water
- d. all of the above

## Module 3: Hazard Controls

As you learned earlier, there are many different types of hazards in the workplace. Hazardous conditions include unsafe materials, equipment, the environment, and employees. Unsafe work practices include: allowing untrained workers to perform hazardous tasks, taking unsafe shortcuts, horseplay, or long work schedules. To combat these hazardous conditions and unsafe work practices, control strategies, called the "**Hierarchy of Controls**" have been developed.

Traditionally, a hierarchy of controls has been used as a means of determining how to implement feasible and effective controls. ANSI Z10-2005, Occupational Health and Safety Management Systems, encourages employers to employ the following five hazard control strategies:

1. elimination
2. substitution
3. engineering controls
4. administrative controls
5. personal protective equipment

The idea behind this hierarchy is that the control methods at the top of the list are potentially more effective and protective than those at the bottom. Following the hierarchy normally leads to the implementation of inherently safer systems, ones where the risk of illness or injury has been substantially reduced. Let's take a closer look at the hierarchy of control strategies.

### What are "feasible" controls?

Hazard abatement (reduction) measures required to correct a hazard must be technologically and economically feasible (reasonable) for the employer. OSHA uses the following criteria to determine feasibility of engineering and administrative controls:

- **Technical Feasibility.** Technical feasibility is the existence of technical know-how as to materials and methods available or adaptable to specific circumstances which can be applied with a reasonable possibility that employee exposure to hazards will be reduced.
- **Economic Feasibility.** Economic feasibility means that the employer is financially able to undertake the measures necessary to abate identified hazards. Economic feasibility is a

major issue to be considered when imposing hazard controls. OSHA may allow the use of PPE to abate a hazard, at least until such time as engineering controls become a less significant economic burden for the company when the following conditions are met:

1. If significant reconstruction of a single establishment involving a capital expenditure which would seriously jeopardize the financial condition of the company is the only method whereby the employer could achieve effective engineering controls;
2. If there are no feasible administrative or work practice controls; and
3. If adequate personal protective equipment or devices are available.

### Elimination and Substitution

Elimination and substitution, while most effective at reducing hazards, also tend to be the most difficult to implement in an existing process. If the process is still at the design or development stage, elimination and substitution of hazards may be inexpensive and simple to implement. For an existing process, major changes in equipment and procedures may be required to eliminate or substitute for a hazard.

These strategies are considered first because they have the potential to completely eliminate the hazard, thus greatly reducing the probability of an accident. Redesigning or replacing equipment or machinery may be expensive, but remember, according to the National Safety Council, the average direct and indirect cost of a lost work-time injury is \$34,000 and \$1,115,000 to close a fatality claim.

Some examples of these two strategies include:

- eliminating the source of excessive temperatures, noise, or pressure
- substituting a toxic chemical with a less toxic or non-toxic chemical

### Engineering Controls

These controls focus on eliminating or reducing the actual source of the hazard. The basic concept behind engineering controls is that, to the extent possible, the work environment and the job itself should be designed to eliminate hazards or reduce exposure to hazards. While this approach is called engineering controls, it does not necessarily mean that an engineer is required to design the control.

Some examples of this strategy include:

- redesigning a process to reduce exposure to a hazardous moving part
- redesigning a work station to relieve physical stress and remove ergonomic hazards
- designing general ventilation with sufficient fresh outdoor air to improve indoor air quality and generally to provide a safe, healthful atmosphere
- ensuring adequate lighting is installed for the environment and tasks performed

### **Enclosure of Hazards**

When you cannot remove a hazard and cannot replace it with a less hazardous alternative, the next best control is enclosure. Enclosing a hazard usually means that there is no hazard exposure to workers during normal operations. There still will be potential exposure to workers during maintenance operations or if the enclosure system breaks down. For those situations, additional controls such as safe work practices or personal protective equipment (PPE) may be necessary to control exposure.

Some examples of enclosure designs are:

- complete enclosure of moving parts of machinery
- complete containment of toxic liquids or gases from the beginning to end of a process
- glove box operations to enclose work with dangerous microorganisms, radioisotopes, or toxic substances
- complete containment of noise, heat, or pressure producing processes with materials especially designed for those purposes

### **Barriers or Local Ventilation**

When the potential hazard cannot be removed, replaced, or enclosed, the next best approach is a barrier to exposure or, in the case of air contaminants, local exhaust ventilation to remove the contaminant from the workplace. This engineered control involves potential exposure to the worker even in normal operations. Consequently, it should be used only in conjunction with other types of controls, such as safe work practices designed specifically for the site condition and/or PPE. Examples include:

- ventilation hoods in laboratory work
- machine guarding, including electronic barriers
- isolation of a process in an area away from workers
- baffles used as noise-absorbing barriers
- nuclear radiation or heat shields.

### Administrative Controls

Administrative controls are aimed at reducing employee exposure to hazards that engineering controls fail to eliminate. Administrative controls work by designing safe work practices into job procedures and adjusting work schedules. Ultimately, effective administrative controls will successfully eliminate the human behaviors that result in 95% of all workplace accidents!

Administrative controls are only as effective as the safety management system that supports them. It's always better to eliminate the hazard so that you don't have to rely on management controls that tend to work only as long as employees behave.

### Safe work practices

Safe work practices may be quite specific or general in their applicability. They may be a very important part of a single job procedure or applicable to many jobs in the workplace. Safe work practices include:

- removing tripping, blocking, and slipping hazards
- removing accumulated toxic dust on surfaces
- wetting down surfaces to keep toxic dust out of the air
- using safe lifting techniques
- maintaining equipment and tools in good repair
- using personal protective equipment (PPE)

Other safe work practices apply to specific jobs in the workplace and involve specific procedures for accomplishing a job. A training program may be essential if employees are working with highly toxic substances or in dangerous situations.

## Interim Measures

When a hazard is recognized, the preferred correction or control cannot always be accomplished immediately. However, in virtually all situations, interim measures can be taken to eliminate or reduce worker risk. These can range from taping down wires that pose a tripping hazard to actually shutting down an operation temporarily.

The importance of taking these interim protective actions cannot be overemphasized. There is no way to predict when a hazard will cause serious harm, and no justification to continue exposing workers unnecessarily to risk. By the way, OSHA believes there is always some kind of interim measure that can be used to temporarily abate a hazard.

## Personal Protective Equipment (PPE)

Using personal protective equipment is a very important safe work practice. It's important to remember that, like other administrative controls, the use of PPE does not control the hazard itself, but rather it merely controls exposure to the hazard by setting up a barrier between the employee and the hazard. Use of PPE may also be appropriate for controlling hazards while engineering controls being installed or work practices developed.

## Final thoughts

The hierarchy of controls is the standard system of strategies to effectively eliminate workplace hazards. Remember, the first question to ask when considering ways to eliminate a hazard is, "can we apply engineering controls?" You may need to use a combination of strategies to effectively eliminate the hazard. Whatever it takes, do it. You are not just saving a life....you are saving a father, a mother, a son, or a daughter....you are saving a family. It's worth the effort!

### Module 3 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. Removing the source of excessive temperatures, noise or pressure is an example of:**
  - a. substitution
  - b. elimination
  - c. engineering Control
  - d. barrier or local ventilation practice
  
- 2. This focuses on eliminating or reducing the actual source of the hazard:**
  - a. engineering Controls
  - b. enclosure of Hazards
  - c. administrative Controls
  - d. feasible Controls
  
- 3. Barriers or local ventilation should be used in conjunction with other types of controls.**
  - a. true
  - b. false
  
- 4. If a hazard exists, what action should be taken immediately?**
  - a. shut down the organization
  - b. notify OSHA of the problem
  - c. take interim measures to fix the hazard
  - d. talk with management

## **Module 4: Personal Protective Equipment (PPE):**

### **What is required?**

OSHA requires the use of personal protective equipment (PPE) to reduce employee exposure to hazards when engineering and administrative controls are not feasible or effective in reducing these exposures to acceptable levels. Employers are required to determine if PPE should be used to protect their workers and have an obligation to provide PPE, including personal protective equipment for eyes, face, head, and extremities, and protective clothing and barriers. Employers must also make sure employees use and maintain PPE in a sanitary and reliable condition.

### **What is proper use?**

Personal Protective Equipment must be worn and used in a manner that will make full use of its protective qualities. Personal protective equipment used incorrectly potentially exposes an employee to hazards, defeating the idea behind using PPE.

Low rates of compliance in wearing PPE usually indicate the safety management system is failing in some way. When employees don't wear or use PPE correctly, it is usually because:

1. the employer does not provide quality PPE
2. the employer does not properly supervise the use of PPE
3. the employer fails to enforce the use of PPE
4. the employer does not properly train employees on the use of PPE

### **What subjects must be trained?**

According to the standard, to meet the minimum training requirements, each employee receiving PPE training must be trained to know at least the following:

1. when PPE is necessary
2. what PPE is necessary
3. how to properly don, doff, adjust, and wear PPE
4. the limitations of the PPE



5. the proper care, maintenance, useful life, and disposal of the PPE

So far, we meet minimum OSHA requirements... but one very important element is missing:

6. The PPE standard does not specifically require education on "why" PPE is necessary

Why is this element so important? Because study after study tells us the most common reason employees don't follow rules in the workplace is because they don't know why the rules are important.

### Educate the "why" as well as train the "how"!

The first five elements in the list describe the **what**, **when**, and **how** about PPE use. The goal is to increase both **knowledge** and **skill** so that the employee is better able to properly use PPE. The methods used to train the employee are primarily discussion and demonstration. To measure knowledge and skill, the instructor usually tests the employee by asking them to do something.

The final "why" element addresses the importance of using PPE and what the consequences of behavior (compliance and failure to comply) will be. The natural consequences include some form of resulting injury or health to the employee. The system consequences describe the nature of the discipline or recognition that will result from performance. The goal of this last element is to increase employee **motivation** to use PPE so that the employee is more likely to use PPE properly.

### Demonstration is the key

Before an employee is allowed to do work requiring PPE, the employer must require each affected employee to:

- demonstrate an understanding of the training elements listed above
- demonstrate the ability to use PPE properly

Demonstration is really the most common and probably the most efficient method to determine employee knowledge and skills. How does the employee demonstrate an understanding of the six PPE training subjects listed previously? Simple, their level of knowledge is measured by asking the employee questions similar to those listed below.

1. What PPE is required for your particular job?

2. When is the PPE required to be used in your job?
3. What are the possible defects your PPE might have?
4. How do you properly care for and maintain/store your PPE?
5. What is the useful life of your PPE?
6. From what hazards does the PPE protect you?

The form of the "test" may be either written or oral. If you are training a number of employees, you should give them a written test to best measure individual knowledge. It's also the intent of most OSHA law that knowledge be measured by written exams.

### **What about online training?**

According to a letter of interpretation (February 4<sup>th</sup>, 2009) about online training, OSHA states that an employer may not rely solely on the use of an online or video training program when training the use of PPE. According to OSHA, the trainee must be able to "don, doff, touch, feel and otherwise manipulate a particular piece of personal protective equipment that an employer may require or provide to protect their employees to prevent injury or illness." In addition to the online training (including this course), PPE training must also include a hands-on portion so that the employee can practice using the PPE.

### **When is retraining required?**

When the employer has reason to believe that any affected employee who has already been trained does not have the understanding and skill required by the PPE standard, the employer must retrain the employee. Circumstances where retraining is required include, but are not limited to, situations where:

- changes in the workplace render previous training obsolete;
- changes in the types of PPE to be used render previous training obsolete; or
- deficiencies in an affected employee's knowledge or use of assigned PPE indicate that the employee has not retained the requisite understanding or skill

### **Who should conduct the training?**

This is a very important question. Whoever the person training PPE is, he or she needs to be an expert who not only understands how to use PPE correctly, but has a thorough understanding

of the importance of doing so. It's critical that the employee understands the importance of wearing PPE, not only for their safety, but their "continuing employment." To meet minimum rule requirements, the employer must verify each affected employee has received and understood the required training. This must be done using a written certification that contains:

1. the name of each employee trained
2. the date(s) of training
3. the subject of the certification

However, when it comes to documentation of PPE training, it's a good idea to go beyond the minimum requirements stated in the standard to make sure the employer can demonstrate (prove) they have met or exceeded their legal obligations with respect to safety training.

Solid PPE training documentation will contain the elements below:

- A statement by the employee that they have received training by the employer on the six subjects listed previously, and that the trainer has demonstrated proper use of the PPE and answered all employee questions about the PPE satisfactorily.
- A statement by the trainer that, through an oral or written test, the employee has satisfactorily demonstrated an understanding of the subjects covered during training, and has, through practice, demonstrated the ability to properly don, use, doff, care for, and maintain the PPE.

Remember, PPE training is absolutely critical to an effective program. Effective training will likely prevent serious injury or even a fatality which makes it all worthwhile.

## Module 4 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. Personal protective equipment (PPE) may be required for the:**
  - a. eyes
  - b. head
  - c. hands and feet
  - d. all of the above
- 2. Employers must also make sure employees use and maintain PPE in a sanitary and reliable condition.**
  - a. true
  - b. false
- 3. Which of the following root causes may result in general non-compliance in the use of PPE?**
  - a. the employer does not provide quality PPE
  - b. the employer fails to enforce the use of PPE
  - c. the employer does not properly train employees on the use of PPE
  - d. all of the above
- 4. OSHA does not require training on the limitations of the PPE.**
  - a. true
  - b. false
- 5. Before an employee is allowed to do work requiring PPE, the employer must require each affected employee to:**
  - a. purchase properly fitted PPE
  - b. demonstrate the ability to use PPE properly
  - c. take a written examination
  - d. both (b) and (c)

6. When the employer has reason to believe that any affected employee who has already been trained does not have the understanding and skill required by the PPE standard, the employer should retrain the employee.
- a. true
  - b. false

## Module 5: Emergency Action Plans

How would you escape from your workplace in an emergency? Do you know where all the exits are in case your first choice is too crowded? Are you sure the doors will be unlocked and the exit route, such as a hallway, will not be blocked during a fire, explosion, or other crisis? Knowing the answers to these questions could keep you safe during an emergency.

### What is an exit route?

An exit route is a continuous and unobstructed path of exit travel from any point within a workplace to a place of safety. An exit route consists of three parts:

- Exit access – portion of an exit route that leads to an exit.
- Exit – portion of an exit route that is generally separated from other areas to provide a protected way of travel to the exit discharge.
- Exit discharge – part of the exit route that leads directly outside or to a street, walkway, refuge area, public way, or open space with access to the outside.

### How many *exit routes* must a workplace have?

Normally, a workplace must have at least two exit routes to permit prompt evacuation of employees and other building occupants during an emergency. More than two exits are required, however, if the number of employees, size of the building, or arrangement of the workplace will not allow employees to evacuate safely. Exit routes must be located as far away as practical from each other in case one is blocked by fire or smoke. But, there is one exception to this rule. If the number of employees, the size of the building, its occupancy, or the arrangement of the workplace allows all employees to evacuate safely during an emergency, one exit route is permitted.

There are some other design and construction requirements for exit routes:

- Exit routes must be permanent parts of the workplace
- Exit discharges must lead directly outside to a street, walkway, refuge area, public way, or open space. These exit discharge areas must be large enough to accommodate the building occupants likely to use the exit route

- Exit stairs that continue beyond the level on which the exit discharge is located must be interrupted at that level of doors, partitions, or other effective means that clearly indicate the direction of travel leading to the exit discharge.
- Exit route doors must be unlocked from the inside. They must be free of devices or alarms that could restrict use of the exit route if the device or alarm fails.
- Side-hinged exit doors must be used to connect rooms to exit routes. These doors must swing out in the direction of exit travel if the room is occupied by more than 50 people OR if the room is a high-hazard area.
- Exit routes must support the maximum permitted occupant load for each floor served, and the capacity of an exit route shouldn't decrease in the direction of exit route travel to the exit discharge.
- Exit route ceilings must be at least 7 feet, 6 inches high
- An exit access must be at least 28 inches wide at all points. If there is only one exit access leading to an exit or exit discharge, the width of the exit and exit discharge must be at least equal to the width of the exit access. Objects that project into the exit must not reduce its width.

### Emergency Action Plan Requirements

If a company has 10 or fewer employees, a supervisor may communicate its emergency action plan orally. If the company has more than 10 employees, emergency action plan must be written, kept in the workplace, and available for employee review. Employers are required to have an emergency action plan (EAP) only when applicable OSHA standard requires it. However, OSHA strongly recommends ALL employers have an EAP. Employers need to have certain elements on hand for several different situations. For example, they need to have procedures for reporting fires and other emergencies, emergency evacuation plans, and an alarm system to alert workers of the problem. In addition, supervisors must designate and train their employees to assist in a safe and orderly evacuation of all employees. They must also review the EAP with each employee covered when the following occur:

- plan is developed or an employee is assigned initially to a job
- employee's responsibilities under the plan changes
- plan is changed

Emergency Action Plan Template: [Word](#) [PDF](#)

### Fire Prevention Plan

A fire prevention plan must be in writing, kept in the workplace, and made available to employees to review. As with the EAP, if an employer has 10 or fewer employees, supervisors may communicate the plan orally. Employers with more than 10 employees must communicate the plan in writing. A fire prevention plan must list all major fire hazards, proper handling and storage materials, and the type of fire protection equipment necessary to control each fire hazard. The FPP must also include the name or job title of the employees who are responsible for maintaining equipment to prevent or control sources of ignition or fires. In addition, when a supervisor assigns employees to a job, they must inform them of any fire hazards they may be exposed to. Employers must also review with each employee those parts of the fire prevention plan necessary for self-protection.

Fire Prevention Plan Template: [Word](#) [PDF](#)



## Module 5 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

1. A workplace must have at least two exit routes to permit prompt evacuation of employees and other building occupants during an emergency.
  - a. true
  - b. false
2. Exit route doors must be locked from the inside.
  - a. true
  - b. false
3. If a company has more than \_\_\_\_\_ employees, emergency action plan MUST be written, kept in the workplace, and available for employee review.
  - a. 5
  - b. 10
  - c. 15
  - d. 20
4. Supervisors must designate and train their employees to assist in a safe and orderly evacuation of all employees.
  - a. true
  - b. false
5. A fire prevention plan must list:
  - a. fire hazards
  - b. proper handling and storage of materials
  - c. type of fire protection equipment necessary
  - d. all of the above